

Amendments to the Claims

1. **(Currently Amended)** A connection inspecting apparatus for inspecting connection of a connected part, said connection inspecting apparatus comprising which comprises:

an irradiation part for applying a radiation to the connected part of members with an application condition ~~kept~~ being invariant;

a scintillator for converting ~~a the~~ radiation passed through the connected part to a visible light;

an imaging device for picking up a plurality of transmission images of the connected part generated from ~~the said~~ scintillator for a plurality of ~~number of times with changing a different~~ storage times time;

B2 a sub-thickness ~~sub-thickness~~ image forming device for forming a plurality of sub-thickness ~~sub-thickness~~ images corresponding respectively to the ~~respective~~ plurality of ~~the~~ transmission images of the plurality of different storage times supplied from said ~~the~~ imaging device based on the basis of a relationship between a brightness density of the plurality of transmission ~~image~~ images and a thickness of the connected part; and

a superimposed image forming device for forming a thickness superimposed image of the connected part by adding the plurality of the sub-thickness ~~sub-thickness~~ images to each other,

wherein said superimposed image forming device forms the thickness superimposed image of the connected part by adding the plurality of sub-thickness images to each other when a value of the thickness of the connected part is within a certain range, and extracts and collects only valid parts of the plurality of sub-thickness images, respectively, so as to form the thickness superimposed image when the value of the thickness of the connected part is not within the certain range.

2. **(Currently Cancelled)**

3. **(Currently Amended)** The connection inspecting apparatus according to claim 1, wherein ~~the~~ said sub-thickness image forming device forms a plurality of first sub-thickness ~~sub-thickness~~ thickness images corresponding to the respective plurality of transmission images at the plurality of different storage times when one connected part is present along an application direction of the

radiation, and ~~also~~ forms a plurality of second sub-thickness ~~sub-thickness~~ images corresponding to each of the plurality of transmission images at the plurality of different storage times in a state with ~~the~~ connected parts overlapping when a plurality of ~~the~~ connected parts are present overlapping in the application direction of the radiation, and

~~while the said~~ superimposed image forming device forms a first thickness superimposed image by adding ~~the a~~ plurality of ~~the first sub-thickness sub-thickness~~ images to each other and also forms a second thickness superimposed image by adding ~~a the~~ plurality of ~~the second sub-thickness sub-thickness~~ images to each other, and subtracts the first thickness superimposed image from the second thickness superimposed image so as to form the thickness superimposed image.

B2 4. **(Currently Amended)** The connection inspecting apparatus according to claim 3, wherein when the connected parts are present at ~~one and the other face~~ opposite faces ~~opposite to each other~~ of a plate-shaped member, the first thickness superimposed image formed by said sub-thickness ~~the~~ image forming device corresponds to the connected part at a first face of the opposite faces ~~the one face~~, and the second thickness superimposed image corresponds to the connected parts at both of the opposite faces ~~the one and the other face~~, so that ~~the said~~ superimposed image forming device obtains the thickness superimposed image of the connected part at a second face of the opposite faces ~~the other face~~ by subtracting the first thickness superimposed image from the second thickness superimposed image.

5. **(Currently Amended)** The connection inspecting apparatus according to claim 3, wherein ~~the said~~ superimposed image forming device extracts and collects only valid parts from the plurality of ~~the first sub-thickness sub-thickness~~ images, respectively, so as to form the first thickness superimposed image, and ~~moreover~~ extracts and collects only valid parts from the plurality of ~~the second sub-thickness sub-thickness~~ images so as to form the second thickness superimposed image.

6. **(Currently Amended)** The connection inspecting apparatus according to claim 1, further comprising a teaching jig of a known thickness ~~which is a member~~ for obtaining the relationship between the brightness density of the plurality of transmission image images and the thickness of the

connected part, said teaching jig being and is formed of a material with a radiation transmittance equal to that of the connected part.

7. **(Currently Amended)** A connection inspecting method for inspecting a connected part, ~~which comprises~~ said connection inspecting method comprising:

applying a radiation to the connected part of members with an application condition ~~kept being~~ invariant, and then converting a the radiation passed through the connected part to a visible light;

picking up a plurality of transmission images of the connected part expressed by the visible light for a plurality of ~~number of times with changing a~~ different storage time times;

forming a plurality of ~~sub-thickness~~ images corresponding respectively to the ~~respective~~ plurality of ~~the~~ transmission images of the plurality of different storage times based on the basis of a relationship between a brightness density of the plurality of transmission ~~image~~ images and a thickness of the connected part; and

forming a thickness superimposed image by adding the plurality of ~~sub-thickness~~ sub-thickness images to each other so as to inspect the connected part when a value of the thickness of the connected part is within a certain range, and forming the thickness superimposed image by extracting and collecting only valid parts of the plurality of sub-thickness images, respectively, when the value of the thickness of the connected part is not within the certain range.

8. **(Currently Cancelled)**

9. **(Currently Amended)** The connection inspecting method according to claim 7, wherein, when a plurality of connected parts are present overlapping in an application direction of the radiation, said the operation of forming of the plurality of ~~sub-thickness~~ sub-thickness images comprises:

~~first,~~ forming a plurality of ~~first sub-thickness~~ sub-thickness images at the plurality of different storage times in a state where ~~the~~ one connected part is present along the application direction of the radiation; and

next, forming a plurality of second ~~sub-thickness~~ sub-thickness images ~~at~~ of the plurality of different storage times in a state where the plurality of ~~the~~ connected parts are present overlapping in the application direction of the radiation; and

said the operation of forming of the thickness superimposed image comprises:

first, forming a first thickness superimposed image by adding the plurality of ~~the~~ first ~~sub thickness~~ sub-thickness images to each other, and ~~also~~ forming a second thickness superimposed image by adding the plurality of ~~the~~ second ~~sub-thickness~~ sub-thickness images to each other; and

next, subtracting the first thickness superimposed image from the second thickness superimposed image.

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10. **(Currently Amended)** The connection inspecting method according to claim 9, wherein said forming of the first thickness superimposed image comprises ~~is formed by~~ extracting and collecting only valid parts from the plurality of ~~the~~ first ~~sub thickness~~ sub-thickness images, respectively, and said forming of the second thickness superimposed image comprises ~~is formed by~~ extracting and collecting only valid parts from ~~the~~ plurality of the second ~~sub thickness~~ sub-thickness images.

11. **(Currently Amended)** A program on a computer readable recording medium for ~~recording programs~~ to make a computer execute, said program comprising:

a process for ~~of~~ applying a radiation to a connected part of members with an application condition ~~kept being~~ invariant, and converting a the radiation passed through the connected part to a visible light;

a process for ~~of~~ picking up a plurality of transmission images of the connected part expressed by the visible light for a plurality of different ~~the number of times with changing a storage time times~~;

a process for ~~of~~ forming ~~sub thickness~~ sub-thickness images corresponding respectively to the respective plurality of transmission images of the plurality of different storage times based ~~on the basis~~ of a relationship between a brightness density of the plurality of transmission ~~image~~ images and a thickness of the connected part; and

a process ~~for~~ of adding the plurality of ~~sub-thickness~~ sub-thickness images to each other so as to form a thickness superimposed image when a value of the thickness of the connected part is within a certain range, and extracting and collecting only valid parts of the plurality of sub-thickness images, respectively, so as to form the thickness superimposed image when the value of the thickness of the connected part is not within the certain range.

12. (Currently Cancelled)

13. (Currently Amended) The program ~~recording medium~~ according to claim 11, wherein a program is further recorded for making the computer execute, when the connected parts are present at opposite faces ~~one and the other face opposite to each other~~ of a plate-shaped member,

the said process of forming the ~~sub-thickness~~ sub-thickness image ~~comprising: a process of forming~~ forms a plurality of first ~~sub-thickness~~ sub-thickness images corresponding to the plurality of transmission images at the plurality of storage times for the connected part present at a first face of the opposite faces, the one face; and ~~a process of forming~~ forms a plurality of second ~~sub-thickness~~ sub-thickness images corresponding to the plurality of transmission images at ~~of the plurality of~~ different storage times in a state where the connected parts are present overlapping at the opposite faces ~~one and the other face~~ in an ~~the~~ application direction of the radiation, and

said the process of forming the thickness superimposed image ~~comprising: a process of forming~~ forms a first thickness superimposed image by adding the plurality of first ~~sub-thickness~~ sub-thickness images to each other; ~~a process of forming~~ forms a second thickness superimposed image by adding the plurality of second ~~sub-thickness~~ sub-thickness images to each other; and ~~a process of subtracting~~ subtracts the first thickness superimposed image from the second thickness superimposed image so as to form the thickness superimposed image of the connected part present at a second face of the opposite faces ~~the other face.~~

14. (Currently Amended) A connection inspecting apparatus comprising which comprises:
an irradiation device for applying a radiation to an object to be inspected having a first connection part and a second connection part ~~a connected part;~~

a scintillator for converting ~~a~~ the radiation passed through the object ~~connected part~~ to a visible light;

an imaging device for picking up a transmission image of the object ~~connected part~~ generated from ~~the~~ said scintillator; and

an image forming device for forming brightness information based on ~~the basis of~~ the transmission image supplied from ~~the~~ said imaging device of ~~a~~ the first connected part and ~~a~~ the second connected part of ~~an~~ the object to be inspected which overlap at an overlapping ~~a~~ part in a thicknesswise direction thereof, and for forming an image of only the second connected part based on ~~the basis of~~ the brightness information.

15. **(Currently Amended)** The connection inspecting apparatus according to claim 14, wherein ~~the~~ said image forming device binarizes the brightness information so as to form the image of only the second connected part by a bright side level ($A+\alpha$) brighter than a reference brightness level (A) of ~~the~~ a transmission image of the first connected part when the object has only the first connected part and by a dark side level ($A-\beta$) darker than the reference brightness level.

16. **(Currently Amended)** The connection inspecting apparatus according to claim 15, wherein, based on an image of the ~~overlapping~~ first connected part and the second connected part overlapping obtained by binarizing the brightness information, an image of only the first connected part obtained by the binarization by the bright side level, and an image of the overlapping part obtained by the binarization by the dark side level, ~~the~~ said image forming device deletes the image of only the first connected part from the image of the first and second connected parts, and adds the image of the overlapping part ~~to an image after the deletion~~ thereto so as to form the image of only the second connected part.

17. **(Currently Amended)** The connection inspecting apparatus according to claim 14, wherein ~~the~~ said image forming device obtains outline position information of the first connected part based on the transmission image of the first connected part, and forms the image of only the second connected part based on ~~the basis of~~ the brightness information and the outline position information.

18. **(Currently Amended)** The connection inspecting apparatus according to claim 17, wherein ~~the~~ said image forming device detects a brightness change at an outline position indicated by the outline position information ~~by using with the use of~~ the brightness information, obtains ~~each~~ position information of a first ~~one~~ position and a second ~~the other~~ position in an outline segment of the overlapping part showing a different brightness change from other positions, obtains information on a divide line passing the first ~~one~~ position and the ~~other~~ second position from the position information, and forms the image of only the second connected part from the brightness information by changing a binarization level at a first region including the first connected part and a second region including the second connected part which are divided by the divide line.

19. **(Currently Amended)** The connection inspecting apparatus according to claim 18, wherein the binarization level formed by ~~the~~ said image forming device at the divided first region including the first connected part is a level for extracting only the overlapping part, while the binarization level at the second region including the second connected part is a brightness level of the second connected part obtained when ~~each the~~ position information of the first ~~one~~ position and the second ~~other~~ position is obtained.

20. **(Currently Amended)** The connection inspecting apparatus according to claim 18, wherein ~~the~~ said image forming device obtains ~~each the~~ position information of the ~~one~~ first position and the ~~other~~ second position based on ~~the basis of~~ a peak value of ~~the~~ brightness.

21. **(Currently Amended)** The connection inspecting apparatus according to claim 14, wherein ~~the~~ said imaging device picks up an ~~the~~ image of the first connected part and the second connected part in ~~the~~ an overlap state with a plurality of changing an image storage time times.

22. **(Currently Amended)** The connection inspecting apparatus according to claim 18, wherein ~~the~~ said imaging device picks up an ~~the~~ image of the first connected part and the second connected part in ~~the~~ an overlap state with a plurality of different changing an image storage time times, and ~~the~~ said image forming device obtains the ~~one~~ first position and the ~~other~~ second position

in the outline segment of the overlapping part ~~by using with the use of~~ the brightness information of a largest brightness change among the brightness information of transmission images for every one of the plurality of different image storage times.

23. **(Currently Amended)** The connection inspecting apparatus according to claim 22, wherein ~~the~~ said image forming device obtains ~~each the~~ position information of the ~~one~~ first position and the ~~other~~ second position based on ~~the basis of~~ the brightness information of a largest peak value of ~~the~~ brightness.

24. **(Currently Amended)** A connection inspecting method, ~~which comprises~~ comprising:
applying a radiation to an object to be inspected which has a first connected part overlapping with a second connected part at an overlapping a part in a thicknesswise direction of the object, and converting a the radiation passed through the object to a visible light;

forming brightness information based on ~~the basis of~~ a transmission image of the first connected part and the second connected part in ~~the~~ an overlap state which is obtained through the ~~conversion~~ converting to the visible light; and

forming an image of only the second connected part based on ~~the basis of~~ the brightness information.

25. **(Currently Amended)** The connection inspecting method according to claim 24, wherein ~~the operation of~~ said forming of the image of only the second connected part comprises is ~~carried out by~~:

binarizing the brightness information so as to obtain an image of the first connected part and the second connected part in the overlap state;

binarizing the brightness information by a bright side level ($A+\alpha$) brighter than a reference brightness level (A) at a transmission image of the first connected part when the object has only the first connected part so as to obtain an image of only the first connected part;

binarizing the brightness information by a dark side level ($A-\beta$) darker than the reference brightness level so as to obtain an image of the overlapping part; and

deleting the image of only the first connected part from the image of the first connected part and the second connected part, and adding the image of the overlapping part thereto ~~to an image after the deletion~~, whereby the image of ~~the~~ only the second connected part is formed.

26. **(Currently Amended)** The connection inspecting method according to claim 24, wherein said ~~whereby the operation of~~ forming of the image of only the second connected part comprises ~~is carried out by~~:

obtaining outline position information of the first connected part based ~~on the basis of~~ a transmission image of the first connected part by using ~~with the use of~~ the brightness information;

detecting a brightness change at an outline position indicated by the outline position information;

obtaining each position information of ~~one~~ a first position and a second ~~the other~~ position in an outline segment of the overlapping part showing a different brightness change from other positions;

obtaining information on a divide line passing the first ~~one~~ position and second ~~the other~~ position from the position information; and

binarizing for a first region including the first connected part divided by the divide line by a level in which only the overlapping part is extracted, and binarizing for a second region including the second connected part by a brightness level of the second connected part obtained when the each position information of the first ~~one~~ position and second ~~the other~~ position is are obtained, so that the image of only the second connected part is formed from the brightness information.

27. **(Currently Amended)** The connection inspecting method according to claim 26, wherein the each position information of the first ~~one~~ position and second ~~the other~~ position are is obtained based ~~on the basis of~~ a peak value of ~~the~~ brightness.

28. **(Currently Amended)** The connection inspecting method according to claim 24, wherein the first connected part and the second connected part in the overlap state is are picked up by changing an a plurality of different image storage time times.

29. **(Currently Amended)** A program on a computer readable recording medium for recording programs to make a computer execute, said program comprising:

a process of applying a radiation to an object to be inspected which has a first connected part overlapping with a second connected part at a an overlapping part in a thickness direction of the object;

a process of forming brightness information based on a transmission image of the first connected part and the second connected part in the an overlap state which is obtained by converting a the radiation passed through the object to a visible light; and

a process of forming an image of only the second connected part based on ~~the basis of~~ the brightness information.

B2 30. **(Currently Amended)** The program computer readable recording medium according to claim 29, wherein ~~a program is further recorded for making the computer execute the said process of forming the image of only the second connected part which comprises:~~ a process of binarizing binarizes the brightness information so as to obtain an image of the first connected part and the second connected part in the overlap state; ~~a process of binarizing~~ binarizes the brightness information by a bright side level ($A+\alpha$) brighter than a reference brightness level (A) at a transmission image of the first connected part when the object has only the first connected part so as to obtain an image of only the first connected part; ~~a process of binarizing~~ binarizes the brightness information by a dark side level ($A-\beta$) darker than the reference brightness level so as to obtain an image of the overlapping part; ~~and a process of deleting~~ deletes the image of only the first connected part from the image of the first connected part and second connected part, and adds ~~adding~~ the image of the overlapping part thereto ~~to an image after the deletion~~ so as to form the image of only the second connected part.

31. **(Currently Amended)** The program computer readable recording medium according to claim 29, wherein ~~a program is further recorded for making the computer execute the said process of forming the image of only the second connected part which comprises:~~ a process of obtaining obtains outline position information of the first connected part based on ~~the basis of~~ the transmission

32. image of the first connected part with the use of the brightness information; ~~a process of detecting detects~~ a brightness change in an outline position indicated by the outline position information; ~~a process of obtaining obtains~~ each position information of a first one position and a second the other position in an outline segment of the overlapping part showing a different brightness change from other positions; ~~a process of obtaining obtains~~ information on a divide line passing the first one position and the second other position from the position information; ~~a process of binarizing binarizes~~ for a first region including the first connected part divided by the divide line by a level in which only the overlapping part is extracted, and ~~binarizing binarizes~~ for a second region including the second connected part by a brightness level of the second connected part obtained when ~~each the~~ position information of the one first position and the second other position ~~is are~~ obtained, so that the image of only the second connected part is formed from the brightness information.

32. (Currently Amended) The ~~program computer readable recording medium~~ according to claim 29, wherein ~~a program is further recorded for making the computer execute the said process of forming the image of only the second connected part which comprises:~~ ~~a process of obtaining obtains~~ outline position information of the first connected part based on ~~the basis of a transmission an image of the first connected part by using with the use of~~ the brightness information; ~~a process of detecting detects~~ a brightness peak value in an outline position indicated by the outline position information; ~~a process of obtaining each obtains~~ position information of a first one position and a second the other position of an outline segment of the overlapping part ~~with by~~ setting the detected peaks as the first one position and the second other position; ~~a process of obtaining obtains~~ information on a divide line passing the one first position and the second other position from the position information; ~~a process of binarizing binarizes~~ for a first region including the first connected part divided by the divide line by a level in which only the overlapping part is extracted, and ~~binarizing for binarizes~~ a second region including the second connected part by a brightness level of the second connected part obtained when ~~each the~~ position information of the one first position and the second other position ~~are is~~ obtained, so that the image of only the second connected part is formed from the brightness information.

33. **(Currently Amended)** The program ~~computer readable recording medium according~~
to claim 29, wherein a ~~program is further recorded for making the computer execute the process of~~
~~forming the~~ brightness information is formed based on the transmission image of the first connected
part and the second connected part in the overlap state by picking up the image of the first connected
part and second connected part with a plurality of different ~~changing an~~ image storage time times.
